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THE STORMS OF JUNE 27TH, 1866.

IN arranging the following account of the thunder and hailstorms of June 27th, I have placed in the forefront a list of places where neither hail nor rain fell, so as to define at once, as far as practicable, the boundaries within which the storms were confined. I shall then proceed with such narrative as I have been able to compile, and lastly give the data on which it is based.

PLACES HAVING NEITHER HAIL NOR RAIN.

NORTH OF RAIN PATH.—Waltham Abbey, Whetstone, Kingsbury, Harrow, Pinner.

SOUTH OF RAIN PATH.—Stoke Newington, Islington, Camden Road, Portman Square, West Brompton, Surbiton Station, Buxley Hill (near Claygate, Esher), Berkeley Street, Upper Harley Street, Bond Street, Pimlico, Camberwell, Wimbledon, Peckham.

PLACES JUST ON THE BOUNDARY OF THE STORM, AND HAVING ONLY A FEW DROPS OF RAIN.

Colney Hatch, very little. *Barnet*, a few drops. *Zoological Gardens*, at 3 p.m. a few rattling claps of thunder, heavy rain drops and a few hailstones, it only lasted 2 or 3 minutes. Sun shining brightly on E. and S.E. of the park all the time. *Dorset Square*, at 3 p.m. a few heavy claps of thunder, and a little rain. *Avenue Road*, very slight rain. *Lord's Cricket Ground*, slight shower, very large drops. *Lancaster Gate, Bayswater Road*, a few large drops at 1.30 and 3 p.m. *Upper Westbourne Terrace*, at 2.55 slight showers, very large drops. *Kingston*, only a few drops of rain. *Ham Lane near Esher*, just laid the dust. *Claygate near Esher*, very slight shower. *Slough* (400 yards south of the station), slight shower about 3 p.m. for 10 minutes.

NARRATIVE OF THE STORMS OF JUNE 27TH.

THE laws regulating the paths of thunderstorms being, I believe, entirely unknown, and probably very complex, it is probable that notwithstanding all my pains, and the somewhat copious details on which this narrative is based, some persons resident in districts whence we have no reports (such as Southall and Twyford) may be able to amend it; if they can, I hope they will.

There seems to have been about 3 p.m., *i.e.* shortly after the hour of maximum temperature, an almost simultaneous outburst of electric action at a variety of points, between the parallels of 51° and 52° north latitude, and extending right across England. It would be of surpassing interest to find these foci, and trace the onward course of each storm, but the task is almost too great; I therefore confine my narrative to those traversing the part of the country shown in the accompanying map.

The first storm seems to have formed between Windsor and Guildford soon after 1 p.m., and moved slowly to the N. until it reached the Thames

near Egham, when it appears to have divided, one portion passing up the river to Windsor, and the other down it over Hampton, Richmond, and Isleworth—that is to say, in a north-easterly direction. An unexplained and difficult fact is, that at Gomer House, Teddington, and at Richmond the storm is reported to have come from the E.; if so, how are we to reconcile it with the facts that half Richmond Park was dry and dusty, and that the observer at Spring Grove, who (on the assumption of an E. to W. motion) should have had the brunt of the storm did not, only registered 0·04 in. of rain, and accompanied his report with a map shewing S.S.W. to N.N.E. motion?

Evidence is wanting as to what occurred in the neighbourhood of Acton, but I am inclined to think it there met the Cricklewood storm (so called for distinction) was overborne by it, and carried back to Egham by about 4 or 5 p.m.

The boundaries of the Cricklewood storm having been described, it remains only to state that the storm appears to have been formed in Upper Holloway, to have skirted the southern side of Highgate Hill, then across Hampstead Village, and Child's Hill, on to Cricklewood where *alone* violent wind was felt, a fine poplar, being broken short off, and the road strewed with branches and twigs; I have not traced it much further to the west, but believe the suggestion previously offered is the most probable.

Some of our great authorities on wind have urged the existence of vertical rotary motion—(*i.e.* if a cyclone under ordinary circumstances is represented by a wheel revolving while lying on its side, a vertical cyclone would be represented by the same wheel revolving in its proper position on the axle of a carriage.) I have mentioned this because it seems to me the readiest solution of a puzzling fact, namely, that the largest hailstones did not do most mischief. Doubtless this was partly due to the relative hardness of the stones, but it was not *wholly* this, as many of the larger stones at Hampstead were of the hard species, yet the damage there was trifling, as it was also beyond Cricklewood, although the hail was large and hard, they fell "quite gentle like," as a native told me at Willesden Green. Now supposing (for it is only a bit of theory) there was such a vertical cyclone, its rotation being such that the motion of its lower half was in the same direction as the general course of the storm, it would solve at once several difficulties; thus—let its lowest portion be assumed to have swept near the surface while crossing over Cricklewood, it would then give wind force sufficient to break the poplar, and by increasing the velocity of the hailstones would produce equal or greater destructive power than where they fell without the wind and yet were larger; moreover, *if* this theory be accepted, it will also explain how large and heavy hailstones could fall "quite gentle like "a mile or two further on, for there the upward motion of the lower advancing quadrant of the cyclone would, by its tendency to lift the stones, partly counteract the force of gravity and so let them fall "quite gentle like" to the earth.

It only remains for me to thank those who have so kindly assisted

me in examining these storms and to subjoin abstracts of their letters which are more interesting than anything I could add.*

NOTES ON THE STORMS OF JUNE 27TH, 1866.

ABBREVIATIONS.—T for Thunder; L for Lightning; T S for Thunderstorm; H for Hail; R for Rain

MIDDLESEX.

SHORTWOOD HOUSE, STAINES.—Clear and warm till 2 p.m., when T S rose in S.W. opposite the wind, and seemed (when over the western part of Surrey) to divide, part taking the course of the Surrey Hills to the south of the Thames towards Kent —and part stretching towards Bucks and taking the hills to the north of the Thames valley, eastward towards Essex. At Staines we received the flank operation of both and escaped the full brunt of either, but having of course some T L and R as the clouds passed over—after a while the storm travelled back to the W. and continued rattling round Staines at intervals till 8 p.m. Total rainfall 0·47 inches.

CAMBRIDGE HOUSE, HAMPTON WICK.—Severe T S with H between 2 and 3 p.m. It commenced with wind N.N.E., then N.E., and E.N.E. (it came from E.N.E.); during its continuance wind shifted to W.N.W., storm following it; this took it over Teddington and Hounslow; storm went off about W.S.W.; wind changed suddenly at 4 to N.E.

THE GROVE, HAMPTON WICK.—T S passed over here from S.E. to N.W. in great violence between 2 and 3 p.m.; hail as large as marbles. Total R=0·18 in.

HAMPTON WICK.—Severe T S and heavy R from 2 to 5 p.m.

HAMPTON COURT.—Heavy T S with H 0·3 or 0·4 in. diameter, between 1.30 and 2 p.m., seemed to come over the Mitre Hotel [? from S.]

HAMPTON COURT.—Very violent T S from 1.30 to 2 p.m. H of all sizes from 0·1 to nearly 1·5 in. diameter (almost as large as hen's eggs) like broken pieces of ice. R fell in sheets.

HAMPTON COURT.—Violent T S between 1 and 2, hailstones mixed with large pieces of ice were 0·5 in. diameter.

BUSHEY PARK.—L struck one of the chestnut trees, heavy H fell, and the roads were flooded.

TEDDINGTON.—Very large H 0·6 in. diameter, some hard and clear like ice (these were occasionally depressed in the middle, thus ∞ [? two frozen together]); others were soft and opaque like snowballs.

GOMER HOUSE, TEDDINGTON.—Dark cloud appeared in S.E. about noon, but did not rise rapidly. Suddenly about 1 p.m. a mass of cloud overspread the zenith, quite as if newly formed there, moving rapidly and spirally; this joined the rising thundercloud, and some *very heavy* drops of R fell spreading on the stones to the size of a crown-piece. "I fear we shall have electric hail," I said to a friend, and in five minutes we did. The R thickened, but decreased in size, and a hailstone came down here and there, but soft, and of moderate size. Meanwhile the L was very vivid, and the T almost simultaneous. At 1.15 the size of the H suddenly increased, the average size and shape being that of acidulated drops, and of clear ice; but among them, here and there, at intervals of 2 or 3 yards amorphous blocks of ice, 0·5 or 0·6 in. across. There was not much wind, and the H and floods of R were driving from E, when suddenly at 1.30 another fall cut right across it, thus X, and presently all the pour was more strongly inclined from the W. than it had been from the E. At 2.30, the storm went away to W. and N., returning in a feeble manner at 4 and 7 p.m. Some glass broken, and trees knocked about.

TWICKENHAM HOUSE.—At 1.40, the R was too dense to see across the lawn, and the garden was flooded—very little, if any hail.

TWICKENHAM OBSERVATORY.—Violent T S from 1.30 to 3 p.m., with R and then H. Total R ·36 in. Wind E.

SPRING GROVE (between Hounslow and Isleworth).—Between 1 and 2 p.m. a T S worked down the Thames Valley over Twickenham, Richmond, and Brentford, when at the last-mentioned place it appeared to be met by a counter-current, and

* Additional information will be found on pages 55 & 56, in the notes of the regular contributors to the monthly table.

driven back. Only 0·04 in. of R fell here, and that was just after the above-mentioned retrogression.

HAMMERSMITH.—Heavy showers between 2 and 3 p.m., the drops of R being of remarkable size. Wind E., and some T in the N.

NIDDRY LODGE, KENSINGTON.—At about 4.30 p.m. I noticed an appearance which I pointed out as a small waterspout. It was a funnel-shaped cloud in rapid motion, but too far off to distinguish rotation. It seemed to break and rise into a heavy cloud. The direction was N. by W. (true), the altitude about 20° above the horizon, and the apparent length of the funnel about 5° when longest. It only lasted a few seconds, say 30, and was seen through a gap in clouds which were moving very slowly westward.

OAKINGTON, WEMBLY.—Heavy R in one hay-field, and at the rick to which the hay was being carried (400 yards off) none at all. T S seemed to come from S.E.

WILLESDEN.—Heavy R but little or no H. The R appeared to have fallen from a point 10° E. of the zenith—*i. e.*, nearly perpendicularly, and therefore there can have been no wind there.

WILLESDEN GREEN.—Heavy R and large H but it fell "quite gentle like."

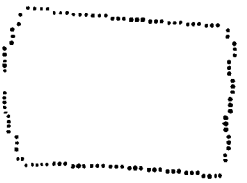
KENSAL GREEN.—Roads flooded by the heavy R.

HARLESDEN GREEN.—Very heavy R, but little or no H.

CRICKLEWOOD.—Storm swept down from Hampstead about 3.15, and for 5 or 10 minutes was very alarming; it fell most violently to the S. of the village between the Windmill Inn and Shoot-up Hill toll-gate. A violent rush of wind from N.E. snapped off a poplar 10 or 12 inches in diameter and strewed the road with twigs and small branches; the H broke a large number of windows, 9 panes in one, 10 in another, 14 in another, and lesser numbers in several others.

SHOOT-UP HILL.—"Being on Shoot-up Hill at a quarter-past 3 yesterday in my trap, the hail fell so heavily the turnpike man would not come out to take his toll of me, and I passed through without paying. It was very dark, and, though I have been 70 years in the world, I never saw such a sight before."

CHILD'S HILL, HAMPSTEAD.—Sudden and *sharp* H storm at 3 p.m., for 10 minutes, stones very large. The accompanying outline is reproduced from a line traced round one after it had partially melted; it must have been quite 1¼ in. by 1 in. It was not icy but like hardened snow. It rained in torrents.



FERN LODGE, HAMPSTEAD (near Jack Straw's Castle).—At 3 p.m. a very heavy hailstorm from N.E., lasting 5 minutes. Ten minutes after the storm, and when the hailstones had melted considerably, several measured more than ·7 in. diameter. They did not, however, fall violently, and only broke a few squares of greenhouse glass. The sun was shining brightly 3 out of the 5 minutes the storm lasted.

MOUNT GROVE, HAMPSTEAD.—Chiefly heavy R, but H whitened the grass. *No wind*, and R and H fell almost perpendicularly; no glass broken. Stones pear-shaped, the two diameters being often ·5 and ·3. In many the small end was clear ice, and the other end opaque—or there was a sort of nucleus or lagoon of clear ice surrounded by radiating striæ, some were granulated like sago pudding, with an opaque nucleus in the centre of each clear granule. R lasted about 20 minutes, and = 0·30 in. Southern half of sky cloudless. Two or three hundred yards N. of us a good deal of glass was broken. T S appeared to move in an easterly current.

ROSLYN, HAMPSTEAD.—Heavy T S from N.E. between 3 and 3.20 p.m. Loud T, and hailstones 0·6 in. diameter. R to the depth of 0·33 in.

MILITIA BARRACKS, HAMPSTEAD.—At 3.15 p.m. T, hailstones 0·6 in. diameter, but no glass broken. The R very heavy, and very large drops.

34, ADELAIDE ROAD, N.W.—Heavy R at 2.50 from N.E. for about 10 minutes—very large drops.

COLLEGE ROAD, ADELAIDE ROAD (200 yards from Chalk Farm Station).—Sharp R for about 20 minutes; H 0·65 in. diameter, but only lasted 5 minutes.

GOSPEL OAK FIELDS, KENTISH TOWN.—H nearly an inch in diameter. [?]

MALDON ROAD, HAVERSTOCK HILL.—About 3 p.m. a most extraordinary shower of H. Three panes broken facing N.E.

ST. ALBAN'S VILLAS, HIGHGATE ROAD (Upper Kentish Town).—Storm came up from E. ; H about 0·7 in. diameter, broke one pane in skylight ; not much R.

HIGHGATE NURSERIES.—No storm on 27th ; a little R at night amounting to 0·05 in.

SOUTH GROVE, HIGHGATE.—Violent H storm from 2.30 to 3 p.m. ; H nearly an inch in diameter ; measured one 2 or 3 minutes after its fall, and even then 0·75 in. square.

OXNEY VILLAS, ST. JOHN'S ROAD, UPPER HOLLOWAY (250 yards E. of Highgate Archway Tavern).—H 0·2 in. diameter, but was half melted. There seemed to be a T S in the S.W. at the time.

YORK ROAD, UPPER HOLLOWAY.—About 3 p.m. some claps of T, and for 5 minutes a few hailstones, the size of marbles, quite round and smooth.

TREDEGAR SQUARE, BOW ROAD, E.—A short, but very heavy R about 2 p.m., no H, but very large drops of R. Sky clear in N.E.

WHETSTONE.—At 2.45 p.m. I saw the clouds rising in one continuous line from S. to N., but when they had nearly reached the position where I was standing in Totteridge-lane, to my great surprise the whole body of them veered in the same straight line towards the E.—*i. e.*, moved eastwards parallel to their first position, remaining still in a line S. to N., they would cross the districts you mentioned in the *Times* of 28th, about 3 p.m. No R or H fell here at the time, but between 5.30 and 6, for a good quarter of an hour, R poured down in torrents, so saturating our roads that notwithstanding the heat, wind, and sunshine of 28th, there were no signs of dust until 29th.

[This communication is somewhat irreconcilable with the fact that all the glass broken in the Cricklewood storm either there or at Hampstead, is reported to face N.E. or E.; if the storm-cloud moved to the E., it would surely break the glass facing the W., not the E. and N.E., as was the case without any exception of which I have yet heard.—ED.]

SURREY.

GUILDFORD.—About 1.30 p.m., a very dense cloud formed over Ash, Aldershot, and Farnham, apparently the centre of a T S.—R very partial ; in places very heavy ; and 10 yards off not a drop.

COBHAM LODGE.—T S about 2 p.m., but no rain ; the L struck a chimney at the White Lion Hotel, Cobham-street, and passed through the parlour into the kitchen below ; the storm passed off in the direction of Weybridge, where they are said to have had hail as large as walnuts.

COBHAM.—T S about 2 p.m. with H. 0·2 to 0·5 in. diameter. It came from S.E. and passed on to W. and N. Total R=0·17 in.

BAGSHOT (2 miles N.E. of) a tree struck by L.

BAGSHOT PARK.—Slight rain (not enough to measure) about 6 p.m. This high table land is generally very exempt from local storms.

DUKE'S HILL, BAGSHOT.—About 1.15 p.m. T in N.E., whence it moved in a circular direction S. and W. until it appeared to be over Aldershot. Thence it appeared to take a N.W. course (still circling round without approaching us), to the direction of Windsor where it appeared to rage furiously, the T being almost incessant from 2.30 to 4, when it became more distant and only continued at intervals until a few minutes past 6, when a T S bore suddenly down upon us from the W. and raged violently for half-an-hour. Rain only fell during this storm, and it amounted to 0·22 in.

EGHAM.—"During the severe storm on Wednesday afternoon, between 5 and 6 o'clock, the electric fluid struck the telegraph wires at the railway station, and entered the office, when a terrific explosion took place, which completely demolished both instruments. Happily no one was near at the moment, otherwise serious consequences might have ensued. Mr. Clay, the station-master, and Mr. Channing, were standing by the entrance, and were for the moment stunned. The hail-stones which fell in the neighbourhood of Thorpe and Stroud were of immense size and did considerable damage to the garden lights and greenhouses, also destroying quantities of fruit and vegetables."—*County Times.*

EGHAM, (1 mile S.S.E. of.)—Distant T at 0.30 p.m., R began at 1.45, heavy shower at 3. Violent T S from 3.55 to 4.10. At 4.0, H 0·5 in. diameter and a

deluge of R. Notwithstanding the oppressive heat and the amount of R, it was more than an hour before all the H was melted. At 5.45 another T S. Hay laid and corn bruised.

PARKSIDE.—T S, H and heavy R from 2.30 to 4.40 p.m. Passed from S.E. to W.

ENGLEFIELD GREEN. (4 miles S. of Windsor.)—T and heavy R but no H.

CUMBERLAND LODGE, WINDSOR PARK.—T S at intervals from 3 to 8 p.m., H & R very heavy for half-an-hour. R to 9 a.m. 28th 0·70 in. Mangold wurzel leaves pierced by the H.

NORFOLK FARM. (1 mile from Cumberland Lodge.)—Many panes of glass broken.

ESHER.—Heavy R, but no H. No R 2 miles S.E. of this place.

CLAREMONT.—Heavy R, but no H.

RICHMOND.—From 1·30 to 2 p.m. H 0·4 in. by 0·25 in.

RICHMOND.—Hailstones 0·6 in. diameter.

RICHMOND.—Very large hailstones; plants much damaged, but no glass broken.

RICHMOND.—At 1.15 p.m. T S and very heavy R. H at 2 p.m. for 5 minutes from the E., diameter 0·25 to 0·30. The R at 1.15 was like tropical R, and quite perpendicular. The L struck the schoolhouse, but only loosened some stones—it crossed from one gable to the other without entering the building.

ST. MARGARET'S, RICHMOND. (On left bank of Thames, near the Railway Bridge.)—Between 2 and 3 p.m. very heavy R, with large H, many stones ·5 in. diameter, but no glass broken.

KEW OBSERVATORY.—Soon after 1 p.m. a heavy T S burst over this neighbourhood, with heavy R, and unusually large hailstones. Distant T throughout the afternoon. Total R = 0·26 in.

PUTNEY.—Much very loud T, but only a few enormously large drops of R.

MORTLAKE.—Heavy T and H the latter 0·5 in diameter and quite icy.

NASSAU SCHOOL, BARNES.—From 2.15 to 2.30 p.m. H 0·5 in. diameter shaped like a champignon without the stalk.

BERKSHIRE.

ROYAL MILITARY COLLEGE, SANDHURST.—Two T SS passed over here, the first at 3 p.m., from S.E. to N.W., the second between 5 and 6 p.m., from N. to S.W. Total R = 0·16 in.

WINDSOR.—T S, hailstones 0·4 in. diameter came from N.

WOODSIDE, OLD WINDSOR.—Three separate T SS; the first from 1 to 2 p.m., the second 5 to 6 p.m., and the third later in the evening, all came from E.S.E.; very little H and no damage; R to 9 a.m., 28th, 0·37 in.

CLEWER, NEAR WINDSOR.—Much glass broken by the H.

BINFIELD, BRACKNELL.—The first storm broke about 2.30 and lasted about 40 minutes, wind S.E. H very heavy and some stones an inch long; a little glass broken in greenhouses, as there was no wind, dwelling houses escaped. At 4.30 the barometer was falling rapidly, about 5 the wind chopped round to N.W. and the storm came back, the clouds twisting and turning in the most extraordinary manner. At 5.40 R commenced and by 6 the storm was awful. Nothing equalled it that I ever saw or heard (since the 27th May 1841). The L was incessant and there was no appreciable interval between it and the T. A few minutes after 6 the H commenced and in a short time the ground was covered with H stones and lumps of rugged ice; they varied in size from that of a large marble to a large-sized walnut. I was told ice had been picked up more than 2 inches long, I myself saw stones fully 1 inch in diameter—the shape was peculiar, like acid drops, the longer axis ¾ to 1¼ inches and the shorter ½ to ¾ inch, there was a darkish spot in the centre from which radiated lines towards the circumference. At 6.10, while watching the vane, the wind went round with a roar to S.E., and for a few moments a high wind added to the fury of the storm. For about ten minutes the turmoil was indescribable: roads, gravel paths, &c., were hurried away with leaves, plants and flowers, and the desolation caused in gardens was very great. The storm moderated at 6.50, the wind went back to W., and at 7 the storm ceased. It was felt in most of the adjoining parishes, but not in all, and the area of destruction, of which the church is the centre, was very small (about ¾ of a mile by ¼ a mile); within it, however, upwards of 2000 panes of greenhouse and hothouse lights were broken. To give some idea of the force of the H, I may mention that I found the flower-beds pitted with

small holes, at the bottom of which were leaves and stalks of geraniums and other plants. The H lay thick on the ground next morning in shady places. Very little damage done to dwelling houses, except from water which made a clean sweep through some, and seriously injured others.

READING.—T S from S.S.E., commencing with heavy H at 3.15 p.m.; main body of T S passed south of this, but part seemed to go N. and rejoin the main body in the W. High wind from S.S.E. Storm over at 5.30.

ROUND OAK, GREENHAM, NEWBURY.—Sunshiny forenoon, T S, and heavy R from 1 to 1.20, hot sun and very close from 1.20 to 3.30, heavy R 3.30 to 6, fine again till 7.40, R from 7.40 till 8.45, fine and moonlight afterwards—total R, 1·70 in. The storm seemed to work round here, with no wind to blow it away.

LAMBORNE, HUNGERFORD.—The TS began at 4.30 p.m., H from 5.45 to 6, breaking many windows and hundreds of greenhouse panes. The hailstones were mostly flattened ellipsoids, principal diameter over 0·75 in. smaller diameter 0·5. It was the most violent T S for many years. Acres of young turnips and swedes were ploughed up and washed away by the H and R.

CHALLOW STATION TO LAMBORNE.—Found that no H fell except in Lamborne. but the R extended over the downs into the Vale of the White Horse.

KENT.

BIDDENDEN, STAPLEHURST.—The 27th was beautifully fine, but the barometer fell steadily; very heavy T clouds appeared in S.S.W. about 7 p.m., and at about 8 p.m. we had a T S, and a good deal of R, the T S apparently came up from the sea about 20 miles off and passed away to N.N.E.; it did not last more than half-an-hour.

FOLKESTONE.—At 3 p.m. a heavy H storm (H stones about 0·4 in diameter) with T. Storm lasted about 20 minutes; what little wind there was, was from E.N.E.

PAVILION, FOLKESTONE.—About 4 p.m. one loud clap of T preceded a shower of R and H (of the usual size). Clouds had been gathering about an hour; the R was general and highly beneficial in this district, and continued the whole evening; no wind, and the sea like a mirror.

SUSSEX.

STEYNING.—On 27th a dense nimbus cloud passed over in a current from N.E. to S.W., and commenced discharging rain and hail, accompanied by vivid lightning and loud thunder at about 3.30 p.m. At 3.45 p.m. when it ceased, the lawn was white with hailstones, many of them of large size, oval in shape, ¾-inch × ½-inch (the major axis of one was certainly ⅞-inch), and my rain-gauge registered 0·23 inch of rain during the brief quarter-of-an-hour of the storm. The thermometer in shade fell from 80° before to 67° after the storm. The barometer having fallen, previously stood at 29·84 (uncorrected). There was scarcely any wind. The storm was very partial. At a place one mile N. of us there was no rain, and no heavy rain beyond a line half-a-mile to the E.S.E., which seems to mark a comparatively narrow band of rainfall; yet, within the line it was severe, as 80 small panes of glass were broken at the Vicarage; our own glass being stouter, escaped breakage. I do not hear of any glass in dwellings being broken, but sky-lights may have suffered. The character of the storm was notable from its suddenness: many clouds of the cumulus character had passed over previously, and gathered in the W.S.W., beneath an over-spreading canopy which was nearly stationary all day; at length, a denser gathering of cumulus came up from the N.E., but without discharge until its south-western limit fell under the verge of the upper canopy when it broke slightly N.W. of this town, and soon in a perfect deluge over us.

HAMPSHIRE.

MILLAND HOUSE, LIPHOOK, HASLEMERE.—Signs of an approaching T S about 2 p.m. but no R till 2.30 when one or two showers fell; the main T S did not, however, pass over here.

WAINSFORD, LYMINGTON.—Between 1 and 2 p.m. a T S came from the E. up the Solent as far as Southampton Water; it then divided, part went along south of the Isle of Wight, the rest up Southampton Water into the New Forest, the L was frequent and T loud, I should think the T S was severe at Southampton; we

only had the extreme edge of it, the total R being only 0·02 inches. The New Forest together with Southampton Water appears to attract all the storms whether E. or W., and they rarely come here.

HERTFORDSHIRE.

HITCHIN.—Smart T S about 3 p.m. for 10 minutes. It was most curiously local, the men in one part of a field complained of R while those in the other had bright sunshine and no R. The roads shewed the same, in one part streaming with R, in another the dust lay thick and undisturbed.

ESSEX.

CHIGWELL.—At 10 p.m two or three very loud claps of T, with a little R; a tree struck in the neighbourhood.

DEBDEN GREEN, LOUGHTON.—This place was skirted by a T S last evening, the clouds being of a singular form. A few minutes after 10, L began in the neighbourhood of Epping, but it did not come very near here.

WILTSHIRE.

HIGHWORTH, SWINDON.—Clear on 27th up to about 5 p.m., wind E.N.E. Clouds came up chiefly from the wind, and at a little before 6 lightning began. The fall commenced about 6 p.m., and was exceedingly heavy; the stones were, so far as I saw, mostly of the shape of truncated cones, about $\frac{3}{8}$ths-of-an-inch at bottom and and 3-16ths at top, and perhaps $\frac{1}{4}$ inch or less high. The hail was soon over, but rain continued for about an hour. I drove out about 7.30, and while driving saw several thunder-clouds and much lightning. The clouds seemed to go in two directions—one about 4 miles to the west seemed to be going W.N.W., while one about 4 miles to the south seemed going westward. I saw rain falling from both up to near 9 when I returned. The sky was clear at 10. I found ·72 (seventy-two) in my gauge this morning, and I expect there was a good deal splashed over, especially at first, and probably but little hail was caught.

LANDFORD (9 miles S.E. of Salisbury).—About 3 p.m. T L; heavy R and large H; R at intervals to 7 p.m. = ·60 in. I hear that 3 miles off they were carrying hay all the time.

TROWBRIDGE.—T S and R amounting to 0·12 inch.

WESTBURY.—Streets are said to have been deluged with rain.

SOMERSET.

FROME.—Heavy R for two hours.

YEOVIL.—At 3.30 p.m. violent T S. R at first in very large drops, afterward almost in sheets; no H.

BATH.—This city was visited by a very heavy T S between 5 and 6.45 p.m. In less than an hour ·81 in. of rain fell; L exceedingly vivid.

BATHEASTON.—Very heavy T S began about 5.35 and R was very heavy for 2 hours—H said to have been as large as an acidulated drop—I picked up some as large as a good sized pea.

DORSET.

CHALBURY, WIMBOURNE.—A T S began here soon after 2 p.m. and lasted till 3.30, a little H about 3 p.m., about 0·4 in diameter—total R, 0·47 in.

GLOUCESTERSHIRE.

MONTPELIER, BRISTOL.—Very violent storm, the R here amounted to 1·12 in.

CLIFTON, BRISTOL.—The great heat of the last two days (84° 25th and 83° 26th) has been succeeded this afternoon (Wednesday, June 27th) by the most severe thunderstorm experienced here during several years.

Even before noon, to-day, suspicious-looking masses of cumulus cloud were observed to be gradually overspreading the eastern portion of the sky. By 3 p.m. it became evident that a thunderstorm was imminent, and shortly afterwards some distant growls, with a few drops of falling rain, indicated that the storm had commenced within no great distance. These threatenings, however, passed off in a measure, and it was not until 5 p.m. that the gathering of heavy masses of cloud in the south-east betokened the near approach of a considerable storm. About 5.20 a peal of thunder was heard, and from this time till 7.40—an interval of 2 hours and 20 minutes—flashes of lightning and peals of thunder succeeded each other with

a rapidity not often witnessed. At least a hundred flashes were observed; between 50 and 60 were actually recorded. The storm probably extended over a large area, but at all events this district was completely enveloped by it, the focus of electrical disturbance appearing successively at almost every point of the compass. Some localities, however, seemed to be specially selected as points for electrical discharges. For example, between 6.12 and 6.24 p.m. an extraordinary number of flashes appeared to strike the earth at points from two to five miles distant in the N.W. It would not be surprising if accounts were received of damage in that direction. From 6.45 p.m. and during the remainder of the storm, the lightning was chiefly in S.E., a large number of the flashes being from 2 to 3 miles distant in that direction. Towards 8 p.m. the sky began to brighten in the north-west, and the heavy mass of clouds in the opposite quarter slowly sank towards the horizon. During the storm two flashes were especially near my place of observation—one at 5.48, in which the interval between the lightning and thunder was scarcely appreciable, the other at 7.33, in which the interval was about one second. The thunder on these occasions was very loud and crashing, though not so loud as is sometimes heard.

Many of the flashes were exceedingly brilliant and beautiful. A large number were vertical in direction, others were horizontal, or formed long jagged festoons across the sky. In several instances a flash was made up of three or four distinct discharges, but so nearly simultaneous that the lines of light combined to produce a single figure, which was often that of an arch touching the horizon at two distinct points. It is very rarely indeed that so excellent an opportunity occurs of studying the forms of lightning. A photographer might have secured the portraits of scores of flashes.

Rain fell to the amount of *eight-tenths of an inch*. Early in the storm hail-stones, 0·33 in. in diameter, fell thickly for a short time.—GEORGE F. BURDER, M.D.

CASUALTIES IN BRISTOL FROM THE THUNDERSTORM.

The heavy thunderstorm of last evening has done some damage in the city. The vast quantity of water which poured through the thoroughfares tore up gravel and stones, and on St. Michael's Hill, the avenues leading to Kingsdown and other hill sides, the soil from gardens and the gravel from the streets were carried down with the stream and deposited on the first levels.

At half-past five a man named Charles Abraham, residing in Castle Court, Temple Street, and in the employ of Mr. Baker, contractor, was riding a horse at the bottom of Clare Street. The lightning struck a saw which he carried in his hand—and he was knocked off the horse. He was taken up insensible, and it was feared that he was dead: but on his being taken into the shop of Mr. Sprackett, chemist and druggist, and attended to, his consciousness was restored, and he was carried home by some of his fellow-workmen. He appeared to be not much hurt.

In the Stapleton Road, the telegraph wire connected with the chimney of a dwelling-house was struck by the lightning. The wire was detached from the post by which it was fastened, and about three hundred yards of it fell almost to the ground. The occupier of the upper room of the house—a female—fainted at the occurrence.

Between five and six o'clock information was received at the various engine-houses that a fire had broken out on the premises of Mr. S. Jones, at the top of Stoke's Croft. The reels were at once manned, and away went the men through the pitiless storm. Upon their arrival it was found that the lightning had struck the chimney, causing a rent of some ten feet, from the chimney-pot to the roof. It had then evidently passed into one of the front bedrooms, and out through an open window. Fortunately no one was in the house at the time.

The lightning caused considerable damage to chimneys in various parts of the city, including a rather large one in Leek Lane; and a saw which was being carried by a man in the Pithay was damaged.

MONMOUTHSHIRE.

NEWPORT.—The T here was terribly grand and the L exceedingly vivid. The R and H was heavier than has been known for many years, and did a great deal of

damage. In Dock Street hailstones fell of upwards of an inch and a quarter in diameter; one was picked up and measured, and its circumference was *four inches.* Square pieces of ice of *upwards of a pound weight each** were found in the neighbourhood of the Docks. High Street was overflowed, being a foot deep in water, and the cellars were in most cases filled. The cellars of Messrs. Davis, Bros., grocers, were filled with water, and goods were damaged to the extent of £250 or £300. Nearly all the garret windows in Dock Street have been broken. Strange to say, the country districts to the north-east of Newport, only some 2 or 3 miles distant, were not visited by the storm.

NEWPORT.—At half-past five o'clock a most frightful storm broke over this town, and lasted with the greatest severity for about one hour. The rain descended so thick and with such velocity that the spray from it was like the spray of mighty waves dashing against each other. Hailstones, or rather large lumps of ice, fell of considerable size, and some of them were picked up weighing at least a couple of ounces. The lightning was excessively vivid, and the thunder was close and heavy; in fact, it resembled the discharging of a large park of heavy artillery. The damage done to the standing crops and other property must be immense.

GLAMORGANSHIRE.

TYNANT, PENTYRCH.—The T S extended over a long tract of country, reaching to Bristol and Newport on the east, and thunder was heard as far as Neath in the west. The weather was intensely hot, and the storm at Pentyrch commenced with great suddenness at 5 p.m. Rain fell in sheets, and ran in rivulets from the hill-sides; in a little more than half-an-hour it amounted to 0·68. It was accompanied by hail of large size and various shapes, some round, others oblong, and some of them were irregularly-shaped masses of ice, quite clear like glass. The greatest diameter of any of them was half-an-inch. Many buildings were struck by the lightning, and a few cattle were killed, but no human being injured. The hail did some damage to the standing corn. Over the area I have mentioned there were several centres of intensified electric disturbance, of which Newport appears to have been the chief in severity.

SIMPLE BAROMETRIC FORMULÆ.

IT will not probably be thought surprising that the letter of "A Lazy Man" has elicited several replies; from them we select three, illustrating varieties of method, inserting them in the order of their receipt.

June 19th, 1866.

SIR,—If your correspondent, "A Lazy Man," will purchase Negretti & Zambra's "Treatise on Meteorological Instruments," (price 5s.), he will find at p. 56 a rule laid down, that for measuring heights not exceeding many hundred feet above the sea level, by means of the aneroid, this simple method will suffice—"Divide the difference between the aneroid readings at the lower and upper stations by ·0011, the quotient will give the approximate height in feet," and at the same page he will find out (by an example given, and actually worked out; and with reference to certain tables *contained in the same work*) how to deal with cases where greater heights are concerned and greater accuracy is required—and he will ascertain that what he requires can be easily attained without reverting either to rule-of-three or logarithms.—I am, Sir, your obedient Servant,

A. K. C.

SIR,—In answer to the letter of "A Lazy Man," in the last number of your Magazine, I take the liberty of informing him that I have for many years amused myself with barometrical measurements. When I have had no object in view but amusement, I have contented myself with calculating according to a scale engraved on one of Sir Henry Englefield's portable barometers. That scale is as follows:—

* Surely an exaggeration; they would have been 3-inch cubes, or spheres about a foot in circumference.

When the quicksilver stands at	ft.		ft.
31·0 inches, ·1 of an inch answers to	84	27·75 inches, ·1 of an inch answers to	94
30·3 ,, ,, ,, ,, ,,	86	27·15 ,, ,, ,, ,, ,,	96
29·6 ,, ,, ,, ,, ,,	88	26·55 ,, ,, ,, ,, ,,	98
28·95 ,, ,, ,, ,, ,,	90	26·00 ,, ,, ,, ,, ,,	100
28·35 ,, ,, ,, ,, ,,	92		

If this scale be right, your correspondent would be wrong if he adopted the idea that the tenth of an inch represented 100 feet in altitude at whatever height the quicksilver stood in the barometer.—Believe me, thankfully yours, W. S. H.

11, Offord Road, N., 20*th June*, 1866.

DEAR SIR,—A correspondent of your *Meteorological Magazine* requires a simple rule for calculating heights from the readings of an aneroid. I think the one which I now send you will suit his purpose. It will give, within 20 feet, the elevation of hills not exceeding a quarter of a mile in height.

RULE :—Read the aneroid to the nearest hundredth of an inch ; subtract the reading at the upper station from that at the lower, leaving out, or neglecting, the decimal point ; multiply the difference by 9 ; the product is the elevation in feet.

Example :—Lower station ... . 30·25 inches.
Upper ,, ... 29·02
123
9
Elevation .... 1107 feet.

Your's respectfully,
R. STRACHAN.

We cannot but think our self-styled "lazy" friend will be gratified with the above letters—especially Mr. Strachan's, which is temptingly easy, and, though we believe at high temperatures not quite so accurate as he assumes, it is sufficiently so for ordinary purposes, and is the very embodiment of simplicity. The following table we constructed for our own use in cases of small altitudes and where extreme accuracy was not necessary.

Mean of Barometer at two Stations.	Mean temperature.		
	25°	50°	75°
inches.			
27	·00104	·00099	·00094
28	·00108	·00103	·00098
29	·00112	·00107	·00102
30	·00115	·00110	·00105

RULE :—Take from the table the value corresponding to the approximate *mean* of the upper and lower barometers, and to the mean temperature (which may be guessed at) and divide the difference of the barometers by it, the quotient will be the height in feet.

Example :—Base of Ben Lomond... 29·890 Mean temperature 50°
Summit of ,, ... 26·656 Mean barometer 28·27
Difference .... 3·234

·00104)3·234(3110 = height in feet.
312
114
104
100
104
4

The true height being 3116 ft.
The above rule gives 3110 ft.
And the error is..... 6 ft.

RAINFALL IN JUNE, 1866.

Div		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	Height of Gauge. Above Ground	Height of Gauge. Above Sea Level.	Depth of Rain. Total Fall.	Depth of Rain. Difference from average 1860–5	Depth of Rain. Greatest Fall in 24 hours. Depth.	Greatest Fall in 24 hours. Date.	Days on which ·01 or more fell.
			ft. in.	feet.	inches.	inches.	inches.		
I.	ENGLAND.	Camden Town	0 6	100	3·98	+ ·94	1·33	30	12
II.		Staplehurst (Linton Park)	0 6	200 ?	3·40	+ ·66	·98	4	9
,,		Selborne (The Wakes)	4 0	500 ?	2·84	— ·39	·47	5	12
III.		Hitchen	2 0	240	2·61	— ·03	·61	1	14
,,		Banbury	7 0	345	2·46	— ·81	·70	1	15
,,		Wisbech	0 6	10	2·50	...	·74	4	13
IV.		Bury St. Edmunds (Culford)	1 2	...	3·42	+ ·84	1·25	4	10
V.		Calne	0 11	250	3·02	...	·79	30	13
,,		Plymouth (Goodamoor)	0 2	580	2·94	—2·21	·76	18	18
,,		Barnstaple	0 6	31	2·48	—1·64	·51	6	13
,,		Taunton (Fulland's School)	1 4	...	·81	—2·06	·20	18	10
VI.		Shrewsbury (Highfield)	5 6	200	3·64	+ ·70	·61	12	12
,,		Tenbury (Orleton)	0 9	200	5·79	+2·27	2·65	1	20
VII.		Leicester (Wigston)	0 6	220	2·41	— ·35	·54	4	15
,,		West Retford	0 6	50	2·99	+ ·83	·65	18	17
,,		Derby	5 0	180	4·11	+1·22	·67	21	17
VIII.		Manchester	2 7	106	3·98	+ ·63	1·06	12	16
IX.		York	0 6	50	2·57	+ ·47	·58	19	16
,,		Skipton (Arncliffe)	3 0	750	3·46	— ·64	1·02	12	14
X.		North Shields	1 0	124	1·68	—1·06	·45	11	17
,,		Borrowdale (Seathwaite)	1 0	422	6·57	—3·94	1·55	21	18
XI.	WALES.	Abercarn	1 3	450	3·59	...	·77	4	13
,,		Haverfordwest	2 0	60	3·97	+ ·32	.91	21	15
,,		Rhayader (Cefnfaes)	2 0	880	3·87	— ·11	·86	1	16
,,		Llanberis (R. Victoria Hotel)	1 0	370	8·44	...	1·78	13	17
XII.	SCOTLAND.	Dumfries	0 5	70	1·84	—1·07	·51	30	13
,,		Hawick (Silverbut Hall)	4 0	512	1·27	...	·26	30	15
XIV.		Ayr (Auchendrane House)	2 3	94	2·17	—1·18	·37	12	12
XV.		Otter House	0 6	130	3·14	— ·70	·83	21	21
XVI.		Leven (Nookton)	0 6	80	1·35	— ·89	·52	20	12
,,		Stirling (Deanston)	0 0	130	2·58	— ·34	·82	20	12
,,		Logierait	1 0	250	1·64	...	·71	20	7
XVII.		Ballater	0 10	656	1·97	...	·52	20	10
,,		Aberdeen	4 8	115	1·45	...	·66	20	16
XVIII		Inverness (Culloden)	3 0	104	·63	...	·18	18	9
,,		Fort William	0 8	20	2·69	...	·65	30	18
,,		Portree	0 4	60	2·78	—2·00	·46	30	14
,,		Loch Broom	0 8	48	1·27	...	·28	16	15
XIX.		Helmsdale	1 0	34	2·12	...	·46	20	13
,,		Sandwick	2 0	78	1·87	+ ·34	·36	20	8
XX.	IRELAND.	Cork	6 0	65	4·27	...	·92	13	14
,,		Waterford	4 0	60	3·91	+ ·93	·64	11	17
,,		Killaloe	5 0	128	4·48	+ ·86	·82	17 & 18	20
XXI.		Portarlington	9 0	236	3·73	+ ·48	·57	4	21
,,		Monkstown	0 6	100	3·73	+1·12	1·14	18	17
XXII.		Galway	6 0	25	4·28	...	·61	5	22
,,		Bunninadden (Doo Castle)	1 0	...	4·61	...	·78	3	20
XXIII		Bawnboy (Owendoon)	1 3	218 ?	3·40	...	·46	20	21
,,		Waringstown	0 4	191	2·57	...	·47	12	15
,,		Strabane (Leckpatrick)	0 5	260	1·98	...	·27	20	19

+ Shows that the fall was above the average; — that it was below it.

METEOROLOGICAL NOTES ON THE MONTH.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm.

ENGLAND.

CAMDEN TOWN.—High temperatures from 20th to 27th. Max. 86°·0 on 27th. T on 27th at 3 p.m., and three violent T SS on 30th, when R fell at the unusual rate of 4 inches per hour; this rate was only maintained for half-a-minute, but several times the rainfall was ·05 per minute.

LINTON PARK.—T (both near and distant) more prevalent than usual. TS unusually near on 22nd, 27th & 28th. Rain heavy and much above the average, while from the sunshine being much less, things are late, the wheat not being in ear till the 21st, the latest I have on record, except 1860 when it was one day later. Most things promise well. Greatest heat on 9th and 23rd.

SELBORNE.—T on 16th, 17th, 21st, and 27th at intervals all the afternoon, and at noon on the 30th. Max. 79°·0 on 28th; min. 38° on 17th: prevalent winds S.E. to S.W. Hail on 16th at 11·30 p.m.

HITCHIN.—The rain on the 27th fell about 3 p.m., during a storm very similar to that mentioned in the *Times*; it did not extend half-a-mile, and there was scarcely any cloud; it went in a S.W. direction. Tremendous T S on 30th.

BANBURY.—T SS on 1st and 16th, on which day an old oak tree was set on fire by the L at Wroxton Park, 2 miles from here. Max. 83°; min. 39°·5. Distant T S on 27th.

WISBECH.—T S at 3 a.m. and at 10 p.m on 4th, two horses killed during the latter storm; slight T S on 30th, at 4 p.m.

CULFORD.—A very severe T S on the 4th, with heavy rain and hail. Several accidents occurred; one fatal to a poor woman by the sick bed of her husband. A sharp hailstorm also on the 17th, lasting only a few minutes, but doing considerable damage. Weather warm, especially about the 10th, and during the last week. Max. 84° on 26th; min. 40° on 17th.

CALNE.—T S on 1st at 4 p.m., and 27th from 5 to 9 p.m.; fine and warm till 17th; intense heat from 21st.

GOODAMOOR.—Much distant T with great heat (but no rain) during the last week.

TAUNTON.—T S on 26th [27th ?], the storm breaking N.W. of the Vale of Taunton around Axbridge; hailstorm at 11 p.m. on 16th.

ORLETON.—T on 1st, 4th, 5th, 16th, and 27th; on the 30th loud T and much L.

WEST RETFORD.—T on 9th and 16th; T S distant in W. at 1 p.m., on 30th. With the exception of the 1st, this has been a pleasant and propitious month; the abundant rainfall, and the generally high range of temperature have brought on vegetation, but fruit trees suffered so much from the frosts of May that the produce (with the exception of apples) is most scanty. Temp. has been above 80° on 7 days. Max. 86° on 27th and 30th; min. 37° on 20th.

MANCHESTER.—Black bulb in vacuo. 141°·2 on 27th.

ARNCLIFFE.—The latter part of the month unusually sultry.

NORTH SHIELDS.—Lily of the valley in flower on 3rd. French rose on 9th. Grass cut on 25th. T on 19th.

SEATHWAITE.—First three weeks excessively cold, raw, and unseasonable. Last week unusually hot, only four days on which the rainfall exceeded ½-an-inch.

WALES.

ABERCARN.—T SS have been prevalent; there was a very severe one on the 27th at Newport 10 miles distant accompained by H stones as large as an egg causing much damage. The month has been comparatively dry, the latter part especially being hot, there having been eight cloudless days on which the temperature in the shade ranged about 80°.

HAVERFORDWEST.—It was wet and cold. Wet and chilly for the time of year till the 22nd, when a sudden change to warmer weather set in, which coming after

the seasonable rain of the first three weeks had a most salutary effect on the hay crop much of which was cut and carried, during the last week. Corn crop and country generally looking well; for six days the heat was excessive. Max. 83°·5.

CEFNFAES.—T S with forked L from 5 to 8 p.m. on 27th in S. & S.E., on which day the temp. in shade was 92°. Cold till the 20th. Last eight days intensely hot.

SCOTLAND.

DUMFRIES.—Till the 24th the weather cold and ungenial; frosts on 16th and 17th, injuring the potatoes on damp soils; from the 24th very hot to the end of the month. On the afternoon of 30th heavy rain, very beneficial to the potatoes which are very bare and scorched. Fine weather at the close for haymaking, but the crop light.

SILVERBUT HALL, HAWICK.—The month, on the whole, has been warm and dry, although there were hail showers on the 15th and frost on the morning of the 19th, which in many instances blighted the potatoes, French beans, and dahlias. On the evening of the 24th the sky was singularly and beautifully dappled, which was followed on the 25th by a perfectly clear and cloudless sky. Thunder heard in the distance on the afternoon of the 29th.

AUCHENDRANE.—The drought of this month has been injurious to vegetation, (both the rainfall and the number of days on which it fell being below the average,) especially on light soils, and some kind of crops suffered severely from the unusual intensity of the cold from the 18th to the 20th inclusive, particularly during the night of the 19th. Max. at 78° on 25th and 26th; min. 32° on 19th.

OTTER HOUSE.—Very warm from the 22nd to 30th. Max. 79° on 26th; hail on the 19th.

NCOKTON.—Great heats, with much sun, and deficient moisture.

DEANSTON.—No thunder during the month. Max. 81° on 26th; min. 30°·3 on 19th. Sharp frosts on mornings of 18th, 19th, and 20th; potatoes much damaged.

LOGIERAIT.—The month opened with great warmth; on the 15th the temperature suddenly changed, till on the night of the 17th there was a keen frost, in many cases blackening the potatoes and injuring tender flowers. On the same night Ben Lawers was covered with a coating of snow—a circumstance reported not to have previously occurred at this season for upwards of 40 years. The close of the month hot, the temperature ranging from 75° to 80°. With the exception of hay, all the crops look well.

ABERDEEN.—T on 16th, 19th, 26th, and 27th. On the 11th, hailstones $\frac{5}{8}$-of-an-inch in diameter, 24 picked up at random weighed 144 grains. Potatoes injured by frost on the nights of the 18th, 19th, and 20th.

PORTREE.—There were frosts on the 1st, 17th, 19th, and 20th, and heavy hail showers and squalls 16th and 17th. On the whole the month was very dry and warm; the pasture grass has suffered greatly from the heat and dryness. Swarms of worms from 2 to 3 inches long, something like catterpillars, have caused sad devastation in the grass in some parts of the island during this month, in some making the ground quite red, as if it had been ploughed. The cattle continue healthy.

LOCHBROOM.—We had every kind of weather but rain; in that respect it was a decidedly dry month; the heat at times was intense, yet on the 15th, 16th, and 17th it was bitterly cold, with hail and sleet below, and the hills covered with fresh snow to their base, yet, immediately after, we had scorching weather; the brooks and rivulets were never known to continue so long waterless—but welcome rain came at last.

SANDWICK.—June has been warm, dry, and bright; the last ten days were particularly warm. Wind 35 miles an hour on the 21st from midnight to 2 a.m.; several peals of thunder on the 27th and 30th.

IRELAND.

MONKSTOWN.—Much rain till the 21st, after which it was fine, and very much warmer. Crops good but not forward; hay generally a very heavy crop.

DOO CASTLE.—The rain came down in torrents at the beginning of the month, whereby vegetation was greatly promoted; turnips that had been sown since the 20th of May, and for more than a fortnight "made no sign," suddenly sprang into existence, contrary to all expectations. Tremendous hailstorm on the 16th;

as far as I could ascertain, it was about a mile in breadth, and by the extent of the devastation it committed on the potatoe crops, &c., I traced it over 7 miles in length, and I doubt not it extended farther; birds were also found dead after it. This hailstorm did not come near the gauge. From the 21st to 30th, summer weather; T on 2nd and 12th.

OWENDOON.—Fine growth of grass, but tender plants, strawberries, &c., much retarded by the inclement weather of the first three weeks; on the 30th a tropical growth.

WARINGSTOWN.—Fine, genial month; making up in a great measure for our previously unfavourable spring; the last week was very hot, the intense sunshine raising the temperature of the soil 1 foot below the surface on several days as high as 67½°, or 1½° higher than at any time last year.

LECKPATRICK.—Fine month, the timely rainfall most useful to the crops. Max. 81° on 25th.

MINIMUM THERMOMETER ON GRASS.

Aberdeen, 3rd March, 1866.

MY DEAR SIR,—In your *Monthly Meteorological Magazine* for February, I see a letter on the exposure of the minimum for terrestrial radiation, and some remarks of yours with reference to that letter. I have been very much puzzled as to the best method of exposing the thermometers both for terrestrial and solar radiation, and as to the proper sort of thermometer to use. Hitherto I have used a Negretti and Zambra's maximum of the ordinary form completely exposed, and an ordinary spirit minimum on zinc frame, both with black bulbs. I have not been satisfied with the results. Early in January I procured a Negretti & Zambra's maximum (in vacuo), and one of their clear bulb minimum thermometers, and mounted them beside the other two. I read all four at 9 a.m. The two minimum thermometers "on grass" are less than four inches apart. The black bulb one is four inches from the *ground* (not the grass), and the clear bulb two inches from the ground. Therefore if either has a more advantageous position it is the one with transparent bulb. Instead of sending you the actual readings of each for the 45 days I have had them in operation side by side, I send you herewith the means for each group of 5 days. Except on 3 days the B. B. was always lower than the clear bulb, the greatest difference being on the morning of 1st March, 4°·5; but they had been under snow for nearly 24 hours at that time, the clear bulb being deeper imbedded.

The black bulb minimum thermometer on the grass seems therefore to be on the whole lower than the clear bulb minimum, and probably if I had the bulbs of both at exactly the same distance above the grass, the difference would have been greater.

I am very anxious to get information on the subject of terrestrial and solar radiation, but I have been unable to obtain any clear and intelligible instruction in any accessible books. You refer your readers to Mr. Glaisher's paper in the *Philosophical Transactions*, but what is a provincial to do who cannot procure that book.

I remain, my dear Sir, Yours, &c.,

G. J. SYMONS, ESQ. A. B.

Five day mean results of reading a black bulb minimum on the grass, and a transparent bulb minimum, placed side by side, both corrected for index error.

1866.	Black bulb min.	Clear bulb min.	Difference.	REMARKS.	
Jan. 16—20	32·24	33·08	0·84		Mean difference, 1·27
,, 21—25	32·02	33·18	1·16		
,, 26—30	32·12	33·78	1·66		
,, 31— 4 Feb.	29·06	30·90	1·84		
Feb. 5— 9	29·18	30·68	1·50		
,, 10—14	24·98	26·22	1·24		
,, 15—19	24·90	24·98	0·08	3 times in this period clear B. above B. B.	
,, 20—24	26·94	28·38	1·44		
,, 25— 1 Mar.	25·02	26·72	1·70	2 days both buried in snow.	

N.B.—B.B. was compared by Mr. Buchan, Secretary of Scottish Meteorological Society, and clear bulb min. by Mr. Glaisher.

Rainfall in each month from January to June, 1866, and comparison of the total fall in the six months, with the average of the corresponding period in the previous six years, 1860-65.

STATIONS.	Jan.	Feb.	Mar.	April.	May.	June.	Total.	Aver.	Diff.
	in.	in.	in.	in.	in.	in.	in.	in.	in.
England & Wales.									
Camden Town	3·90	3·72	1·69	1·76	2·03	3·98	17·08	11·82	+5·26
Linton Park.....	3·83	4·55	2·27	2·09	·81	3·40	16·95	12·26	+4·69
Selborne	6·23	5·47	2·72	2·78	1·56	2·84	21·60	14·80	+6·80
Hitchin.....	3·63	3·28	1·28	1·65	1·04	2·61	13·49	11·14	+2·35
Banbury	2·57	2·30	1·33	1·52	2·17	2·46	12·35	12·38	— ·03
Culford	2·48	3·59	1·30	1·85	1·66	3·42	14·30	10·98	+3·32
Goodamoor	8·44	6·52	4·42	2·98	3·16	2·94	28·46	25·19	+3·27
Barnstaple	5·44	4·56	3·23	1·46	1·05	2·48	18·22	17·32	+ ·90
Taunton	5·15	4·05	3·44	1·91	1·64	·81	17·00	12·93	+4·07
Shrewsbury	2·40	2·18	1·42	·68	1·56	3·64	11·88	11·87	+ ·01
Orleton	3·00	3·02	2·31	1·69	·94	5·79	16·75	14·46	+2·29
Wigston	2·08	2·78	1·27	1·31	1·10	2·41	10·95	11·62	— ·67
W. Retford	1·25	2·25	1·22	1·27	1·07	2·99	10·05	10·05	·00
Derby	1·60	2·25	1·72	1·04	1·75	4·11	12·47	11·99	+ ·48
Manchester	3·25	2·98	2·17	·30	1·54	3·98	14·22	14·91	— ·69
York	1·64	2·50	1·35	1·05	·58	2·57	9·69	10·10	— ·41
Arncliffe	10·11	9·15	3·60	2·01	1·92	3·46	30·25	24·61	+5·64
N. Shields..... ..	1·51	1·78	2·47	1·47	1·14	1·68	10·05	12·68	—2·63
Seathwaite	25·99	19·17	13·05	5·97	5·06	6·57	75·81	68·09	+7·72
Haverfordwest	7·90	5·41	5·39	2·21	1·36	3·97	26·24	19·60	+6·64
Cefnfaes.....	7·42	6·03	3·93	1·33	1·18	3·87	23·76	20·07	+3·69
Average							19·59	17·09	+2·50
Scotland.									
Dumfries	5·56	3·00	2·03	·96	1·41	1·84	14·80	17·09	—2·29
Auchendrane	8·30	5·30	2·13	·77	1·94	2·17	20·61	20·29	+ ·32
Otter House	10·89	7·41	4·43	2·30	1·66	3·14	29·83	25·59	+4·24
Nookton	2·80	4·10	2·02	1·45	1·50	1·35	13·22	12·13	+1·09
Deanston	6·96	5·91	2·75	2·11	1·11	2·58	21·42	18·56	+2·86
Portree	19·17	10·90	6·40	3·80	1·95	2·78	45·00	48·05	—3·05
Sandwick	4·33	5·63	3·08	1·21	2·15	1·87	18·27	14·64	+3·63
Average							23·31	22·34	+ ·97
Ireland.									
Waterford.....	5·42	2·70	3·51	2·41	1·28	3·91	19·23	17·25	+1·98
Killaloe.....	6·63	5·51	3·85	2·05	3·06	4·48	25·58	21·02	+4·56
Portarlington	3·72	2·99	2·92	1·64	1·19	3·73	16·19	17·82	—1·63
Monkstown	2·59	2·30	4·15	2·11	1·58	3·73	16·46	13·77	+2·69
Average							19·37	17·47	+1·90

From the above table the following facts are evident:—

(1) In England and Wales the fall has been about 2½ in. above the average, say 15 per cent. in excess.

(2) In Scotland the fall has been about 1 in. above the average, say 4 per cent. in excess.

(3) In Ireland the fall seems to have been about 2 in. above the average, say 11 per cent. in excess.

(4) Speaking roundly, the rainfall of the past six months has been about one tenth part greater than usual; but in Middlesex, Kent, and Hampshire it has been nearly half as much again as usual—42 per cent. in excess,